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COMPLEMENTARY PRIMATES STUDY
CBG EXTENSION PROJECT
Part 2 – Rapid Assessment

WCF November 2015

EXECUTIVE SUMMARY

This report aims to present an analysis of the rapid assessment of primate populations undertaken in the CBG-Halco concession in September and October 2015. The data, collected by three teams in accordance with recognized methodologies, are presented here and are used as a basis to characterize the concession following IFC Standard 6 criteria (2012) and present a first but quantified estimation of the potential impact of a mitigation hierarchy on the endangered primate species in the concession.

The presence of a healthy population of chimpanzees in the CBG-Halco concession was previously suspected due to the long-term biomonitoring undertaken by WCF in the neighboring concession (GAC). Over 5 years (2010-2015) WCF found a population of chimpanzees inhabiting not only the GAC concession but also the surrounding areas, including the western part of the CBG-Halco concession. This first rapid assessment provides an estimated mean **chimpanzee population of 118 individuals** (mean= 62 individuals, Confidence Interval (95%): min= 33, max= 118 chimpanzees) representing the baseline biological value of the concession. However, a gradient of densities seems to be present in the concession, with less chimpanzee signs observed closer to the areas with active CBG mining sites and the city of Sangaredi. This suggests that part of the chimpanzee population in the concession has already been negatively impacted and that this impact extends over the area of direct impacts.

The landscape in the concession is dominated by fallow land, a heavily modified landscape due to human exploitation. This habitat, while not ideal for chimpanzees, can still be used by them for nesting and foraging. More studies will be required to understand if this population is reproducing at a healthy rate. Due to the relative unsuitability and degradation of the ecosystem, the chimpanzee population in this concession is relatively small in comparison to the unmined neighboring GAC concession. Chimpanzees live in close social groups that violently defend their territory and are highly sensitive to habitat disturbance, including to the loss of foraging grounds (they rely on several hundred different plants - in particular ripe fruit - as a part of their diet), as well as trees for building their nests. This complex interaction with the environment is further affected by fragmentation of the habitat seen in the concession in the form of deforestation and roads that prevent the migration of females between groups which in turn disturbs reproductive patterns.

Among the other primate species that could have been depleted in the concession, the main one that is known to the region, is the endangered red colobus monkey (*Procolobus badius tiemminckii*), that may or may not be in the CBG-Halco concession. Four other species of primates have been found to live in the concession, the green monkey[1] (*Chlorocebus sabaeus*), patas (*Erythrocebus patas*), mangabeys (*Cercocebus atys atys*) and mona guenon (*Cercopithecus mona campbelli*). None of these species or sub-species is endangered or threatened, and are widely present throughout Guinea.

Therefore, according to the IFC Standard 6 (2012), the whole CBG-Halco concession is considered **Critical Habitat for chimpanzees under criterion 1**. However, based on the

[1] Previously known as Cercocebus sabaeus and often referred to as a Vervet or Callithrix monkey.

fact that more than 17,000 chimpanzees are still present in Guinea (WCF 2012), the whole CBG concession falls within the **Tier 2 sub-criteria** (see IFC Guidance Note 75 2012b).

WCF suggests a mitigation hierarchy to be implemented before, during and after mining activities. However, even if this is helpful for other primate species and mammals within the concession, the residual negative impacts would remain at 70% for the original chimpanzee populations due to the highly sensitive nature of this species to any human interference. In other words, the **residual negative impact value is 83 chimpanzees** that need to be compensated for with an offset project. For an offset to achieve the IFC objective of "no-net loss" or better, the "net-gain" requirement, the objective would be to gain 249 chimpanzees (value of lost chimpanzees multiplied by an "offset ratio" of 3 to account for the uncertainties of the mitigation impacts and the offset establishment).

A more detailed, long-term and wide-ranging study will be needed in the CBG-Halco concession to monitor the development of the situation on site. This should include large and medium mammals as well as primates in an area including up to 5km outside of the concession and should be complemented with a camera trapping study and vegetation mapping to fully understand the dynamics and ecology of the wildlife in the concession.

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1 INTRODUCTION

The Compagnie des Bauxites de Guinee (CBG) mandated the Wild Chimpanzee Foundation (WCF) for a rapid assessment of the primate population within its new extension in the CBG-Halco concession. CBG is seeking IFC financial support and therefore has a need for a precise estimation of the endangered primate species within their concession, the importance of critical habitat and the residual negative impacts estimated after mitigation. The time constraints for this study were important and it needs to be taken into consideration that these results are indicative but provisional. From the IUCN red list of threatened species (2015), two primate species likely to be present in the concession are of special importance: the western chimpanzee (*Pan troglodytes verus*) and the red colobus (*Procolobus badius temminckii*).

Therefore, the aims of the present report are the following:

- Present the results of 2015 biomonitoring of the new CBG-Halco concession with a special focus on endangered primate species such as the chimpanzee and the red colobus monkey,
- Analyse the results with a view to quantifying the potential impacts of mining activities on the endangered primate species present in the concession,
- Use the results to present informed general recommendations as to how to implement a mitigation strategy including an offset program to permit CBG to fulfil the IFC Standard 6 requirement.

CBG needs to obtain a detailed and quantifiable knowledge of the chimpanzee and red colobus populations in their concession, including the spatial distribution of use of the concession to be able to plan optimal avoidance and mitigation measures. Due to time constraints, WCF had to conduct a rapid assessment to produce maps of the spatial distribution of such populations and obtain an initial estimate of chimpanzee abundance. This rapid assessment will allow WCF to adopt a specific design adapted to the robust long-term monitoring program required by CBG. However, present range use by chimpanzees and other primates as well as important seasonal and yearly variations, may not yet be considered and will need additional studies.

2 METHODOLOGY

2.1 LINE TRANSECT SURVEY

To estimate the size of the chimpanzee population within the CBG–Halco concession an in-field assessment was necessary. Due to time constraints a rapid assessment was undertaken prioritizing vital areas within the concession and excluding those areas, such as the urban centre of Sangaredi, where it is highly unlikely to encounter chimpanzees. The protocol followed the most rigorous standards recommended by the International Union for Conservation of Nature (Kuehl et al. 2008, IUCN / SSC Primate Specialist Group, Section Great Apes - www.apes.org and http://www.primate-sg.org/best_practice_surveys/). It consisted of recording all direct observations (visual observations of the individuals themselves) and indirect observations (droppings, footprints etc.) of small and large mammals, with a particular emphasis on chimpanzees. Additionally, signs of human activity such as hunting, farming and logging were noted along systematically placed transects covering the whole of the concession. This inventory was conducted in accordance with approved methodologies used extensively by the WCF for its biomonitoring programs across West Africa (see Campbell et al., 2008, 2010, Kouakou et al. 2011 N'Goran et al., 2012).

For this first phase in the CBG–Halco concession, in 2015, three teams of field data collectors, drivers and cooks, totaling 23 persons, all of Guinean nationality plus 2 expats assistants, led the survey work over a period of a month from September to October 2015. Each field data collector undertook a week-long education and training course at the beginning of the project, on how to use specific equipment (compass, GPS, data sheets etc.) and how to fulfil the set roles for the field data collection, and collect quality data.

Line transects were undertaken by the trained field data collectors. They would walk along systematic linear transects (theoretical straight lines) and record observations on a data collection sheet. For each observation made, details such as geographic coordinates, distance from the start of the transect, habitat types, and the perpendicular distance from the transect to the observations were also recorded. All direct and indirect signs of presence of large fauna, including chimpanzees, and human activities were recorded. The distribution of these perpendicular distances allowed us to determine the optimal distance of detection from the transect, where all the observations are visible and counted (a factor dependent in particular, on the density of the vegetation). By combining this "optimal detection area" with the average production and decay rates of chimpanzee nests, the chimpanzee density was calculated. Using this density and the total surface of the study area, the estimated number of weaned chimpanzees living on the site was calculated (see Kuehl et al. 2008). Taking into consideration that an estimated 17.5% of the group members are infants sleeping in the nest with their mothers and who do not therefore build nests (Plumptre and Reynolds 1996), a total number of chimpanzees was then be estimated.

Surveys ran along, or up to the edge of the concession thereby covering an additional area outside of the concession that was visible from the transects. Thus the actual surveyed area consisted of the CBG-Halco concession plus said additional area (614 km^2) minus the land containing the refinery, active mines, and the main urban centre of Sangaredi (84 km^2). This constituted an area of 530 km^2 that it was necessary to inventory, given that habitats favorable to chimpanzees were encountered throughout rural areas in the region. A systematic design of 70 transects was established to cover the area (see Figure 1). These transects are 2 km each in length (minus insurmountable obstacles) and are spaced 2 km apart. An exception was made in areas of high chimpanzee concentration (according to our previous survey in the buffer area of GAC concession), where some of these transects run continuously without a break. Moreover additional transects of 2 km each in length have been placed in this area in order to increase the precision and the detection of chimpanzee nests. This produced an actual effort of 138.89 km for the CBG-Halco concession some originally planned transects going through insurmountable obstacles. A tenet of this method is that the sampling effort needs to be sufficient to reliably estimate animal population abundance values and this was proposed to occur when a minimum of 60 observations by animal species are made (Bukland et al. 2001). Luckily, twice this number of chimpanzee nests was observed during the survey period.

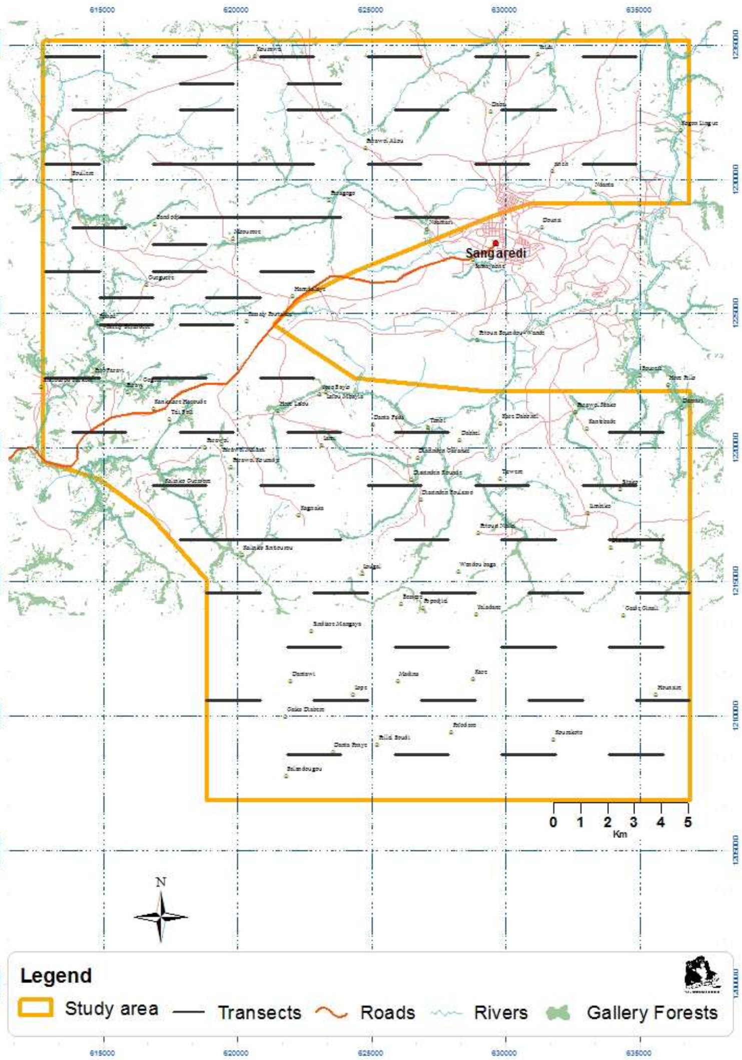

Figure 1: Design showing the placement of the transects employed for the rapid assessment of the CBG-Halco concession September – October 2015

Once the fieldwork was completed, we analyzed the data using two different but complementary tools: The Distance Sampling method (Buckland et al. 2001, Kuehl et al.

2008), to estimate the abundance of mammal species using the perpendicular distances of nests to the transect[2]; and ArcGIS software, using in the Inverse Distance Weighted (IDW) spatial analyst tool in particular, to obtain spatial distribution maps based on spatial interpolations of all the observations recorded on the line transects (nests, droppings, footprints, etc.). For densities or encounter rates, a mean value was calculated for each transect. Each mean value was then assigned to the central point of the corresponding transect, and the punctual encounter rates were interpolated using the IDW method in order to obtain the spatial distribution maps. To estimate the density of chimpanzees within the study area, we combined the data related to the perpendicular distances of nests relative to the transects with their average degradation time - estimated at 194 days (Brugière-Fleury et al. 2010) - as well as a production rate of 1.14 nest per weaned individual per day (Kouakou et al. 2009).

[2] The distance sampling method, specifically developed for estimating population size of elusive animal species, corrects for missed observations under the assumption that all observations above the transect are detected, while detection rate decreases with increasing distance away from the transects (Buckland et al. 2001). Therefore, after each transect has been done, we must control for this assumption and ensure that the detection rate is distributed as expected. This was the case in the monitoring within the CBG concession (WCF reports).

3 RESULTS

3.1 CHIMPANZEE

3.1.1 ABUNDANCE

In total, 351 nests were observed along 138.89 km of transect giving - using the Distance software - a density of 0.09 individual/km² and an estimated population of 62 weaned and unweaned individuals (Table 1).

Table 1: Estimation of the Chimpanzee populations within the concession CBG – Halco concession, as found during the September/October 2015 survey.

	CBG
Number of nests	351
Km of transect surveyed	138.89
Density (weaned ind./km²)	0.1
Method Precision (CV)	33.0%
Mean number of weaned individuals	53
Mean number of all individuals *	62
Min. number of all individuals inside concession **	33
Max. number of all individuals inside concession **	118

* In natural population of chimpanzees, 17.5 % of the individuals are unweaned, meaning infants still sleeping in the nest of their mothers. This value needs to be added to the weaned individuals constructing nests.
Density x 685 km² (area of GAC Concession) and 530km² (area of CBG – Halco concession monitored this year)
** With a 95% Confidence Interval, values calculated with the program DISTANCE.

The mean chimpanzee abundance (all individuals) in the CBG concession is approximately 62 **individual**s. The confidence interval (CI) expresses the precision of the method and thus provides the maximum and minimum interval within which the real number of chimpanzees lies (with a 95% probability). Thus, for 2015, we can estimate that a population of between 33 and 118 chimpanzees was living in the CGB concession[3]. As a conservation measure, and to avoid the danger of underestimating the size of the population, we need to consider **the upper estimate** as the **Biological Value before the start of the new mining operation of the CBG concession: 118 individuals** in 2015**.**

[3] The DISTANCE program requires that the detection accuracy of chimpanzee nests decreases in a specific way with distance. After controlling for this with our data, we needed to truncated the curve at 60 meters and thereby obtained a very good fit with the theoretical curve (Goodness of fit= 0.63) producing a more accurate confidence interval.

This value might be an underestimation for two reasons: First, chimpanzees possess overlapping territories that are not restricted by the legal limits of the CBG-Halco concession. Indeed, yearly variation in number of individuals has to be expected since we do not know the range limits of the chimpanzee groups within the CBG concession (see Figure 2 below that illustrates this specific point). For this reason, it would be better to include part of the surrounding area in the study to obtain a more precise estimate. Secondly, and more importantly, part of the CBG-Halco concession has already been significantly disturbed by mining operations undertaken by CBG in the east around and south of the city of Sangaredi. This represents an area of 84 km^2; 15% of the surface of the CBG-Halco concession. As we will see in the results, this disturbance is visible in the spatial distribution of chimpanzee densities and seems to indicate that chimpanzees might be negatively impacted by this for over 5 kilometers.

Yearly variation in home range is exhibited by chimpanzees thus, it is important to consider data over many years to gain a better and more accurate understanding of the population size. Such variations in home range use are the result of fluctuating levels of fruit production or other essential resources within one area, fluctating levels of fruit production between different areas within the concession and/or an increase in bushfires which was seen in the neighbouring GAC concession in 2011-12.

A preliminary comparison with other known chimpanzee populations in Guinea shows that the population inhabiting the CBG-Halco concession is comparable to the population found in Gadha Woundou Classified Forest in the Foutah Djallon (Moyenne Guinée). Although with a lower density found I the CBG concession, it may be higher than in some important Guinean protected areas such as Ziama (see Table 2). On a regional level, one of the main forested areas in West Africa, the Taï National Park in Côte d'Ivoire, an area of great importance for the conservation of biodiversity, with a special emphasis on chimpanzees had in 2014 a lower chimpanzee density than the CBG concession, with 0.054 weaned ind./km² (and a total population of 288 individuals for 5363 km^2) (Tweh et al. 2014, Kouakou et al. 2014, IUCN 2010).

Table 2: Chimpanzee populations in national parks, main protected areas of Guinea and two mining concession as surveyed by the WCF. For each site, we present the total protected surface area, the chimpanzee density and population size, and the number of chimpanzee signs encountered per kilometer of transect.

Protected Areas in Guinea	Area (km2)	Chimpanzee Density (weaned ind./km2)	Chimpanzee Population size (weaned)	Encounter rate (occurences/km of transect)
Foutah Djallon	80 455	0.22	17 700	NA
Bafing Area	8 275	0.57	4 717	7.37
Haut Niger NP	1 200	0.35	420	2.34
APS Koumbia	800	0.37	296	3.37
IR Mounts Nimba	125	1.33	166	6.58
GAC Concession	685	0.21	147	2.17
APS Oure Kaba	490	0.17	86	1.45
Diecke CF	584	0.14	80	0.3
CBG–Halco concession	530	0.09	53	2.52
Gadha Woundou CF	280	0.17	47	2.19

FR Kankan*	5 314	0	0	0
Badiar NP*	278	NA	NA	0.03
Ziama CF*	1 171	NA	NA	0.04
Protected Areas in Côte d'Ivoire				
Taï NP	5 363	0.099	540	0.41

NP: National Park, IR: Integral Reserve, CF: Classified Forest, FR: Faunal Reserve, APS: Agro-Pastoral Sector
NA: Not applicable as the observations were too low to allow for a calculation of chimpanzee density and population size

3.1.2 SPATIAL DISTRIBUTION

The distribution of chimpanzee signs in the concession is presented in Figure 2, and shows that chimpanzee signs have been documented throughout the concession, with the notable exception of the north-east corner. A vision inspection of the Figure 2 suggests that less chimpanzees are found near active mining sites, like in the north-east corner (close to the active CBG-Gaoual and CBG-Houda mining concession) as well along the Boké-Sangaredi road.

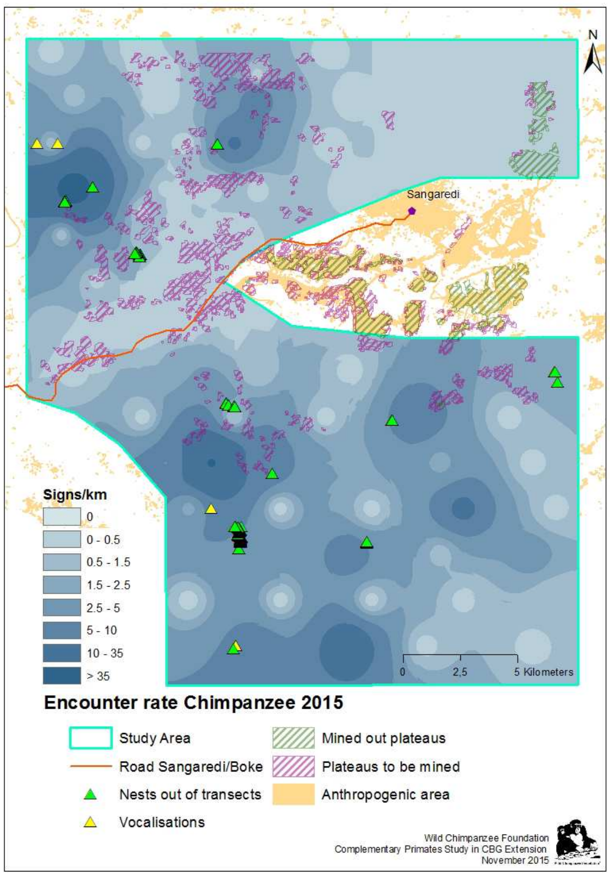

Figure 2: Spatial distribution map of the chimpanzee encounter rates in the CBG-Halco concession as documented in september- october 2015. The darker blue shading indicates higher frequencies of chimpanzee signs.

The distribution of chimpanzee encounter rates for this period may suggest the presence of two to five different groups; one or two in the north-west part of the concession, and between one and three in the south of the Boké-Sangarédi main road, all near the GAC boundary. Due to the fact, that there is scant knowledge regarding chimpanzees living in such dry habitats we should remain careful; it is possible that there is just one group with a very large home range alternatively, there may be many small groups. However, it should be taken into consideration that the more groups there are the greater the potential for inter-group aggression, meaning that the negative impact will be higher with many groups than with just one. Additionally, it is necessary to consider this population in combination with the GAC chimpanzee groups as they will have an interacting dynamic. Long-term camera trapping and monitoring will help to identify individuals and determine the number of groups in the concession.

A first preliminary analysis of chimpanzee distribution within the CBG concession shows that the density of chimpanzee signs decreases the closer the transect is located to the active mining CBG concessions (Halco and Gaoual) as well as with closer proximity to the city of Sangaredi (see Figure 3). It is striking that this positive effect is visible even for distances up to 5 to 10 kilometers (Figure 3)[4]. Roads are well documented to be a danger and a disturbance to wildlife leading rapidly to strict fragmenting effect as animals do not dare to approach busy road at all.

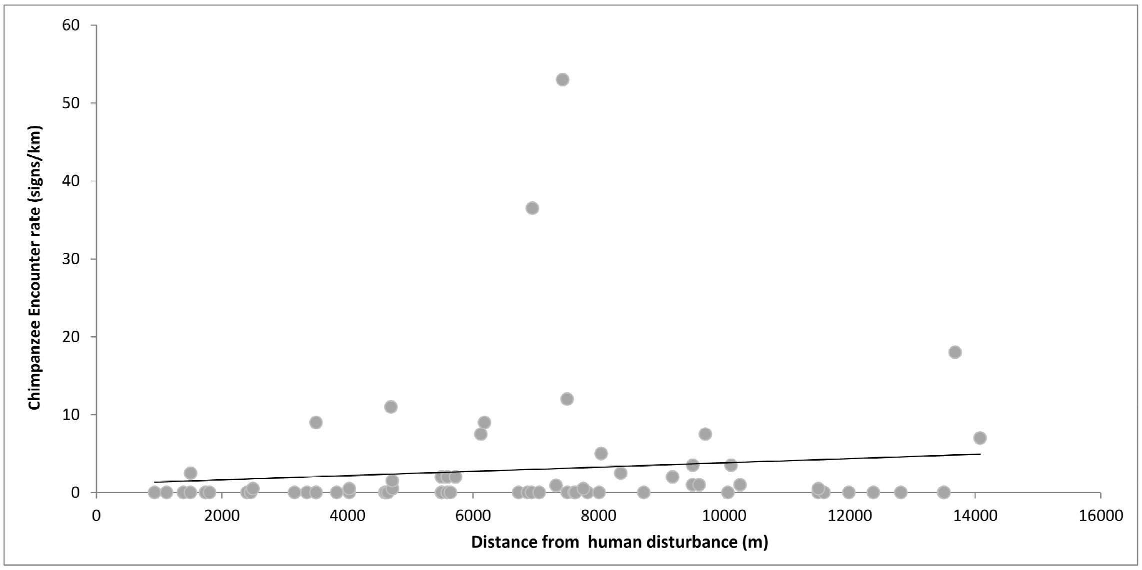

Figure 3: Relationship between chimpanzee encounter rate and the average distance from human disturbance at which these signs were observed (CBG-Halco concession September-October 2015). Each point represents, the value observed on each one of the transects in the concession (N=69), and the line shows with a simple linear model the average increase of chimpanzee signs the larger the distance from human disturbance.

[4] The value of the statistical test of the correlation between chimpanzee encounter rate and human disturbance is highly significant (df= 68, p<0.001)

Figure 4 shows the interpolation of encounter rates for both the GAC and CBG-Halco concession suggesting a clear interconnection of chimpanzee range across the two concessions.

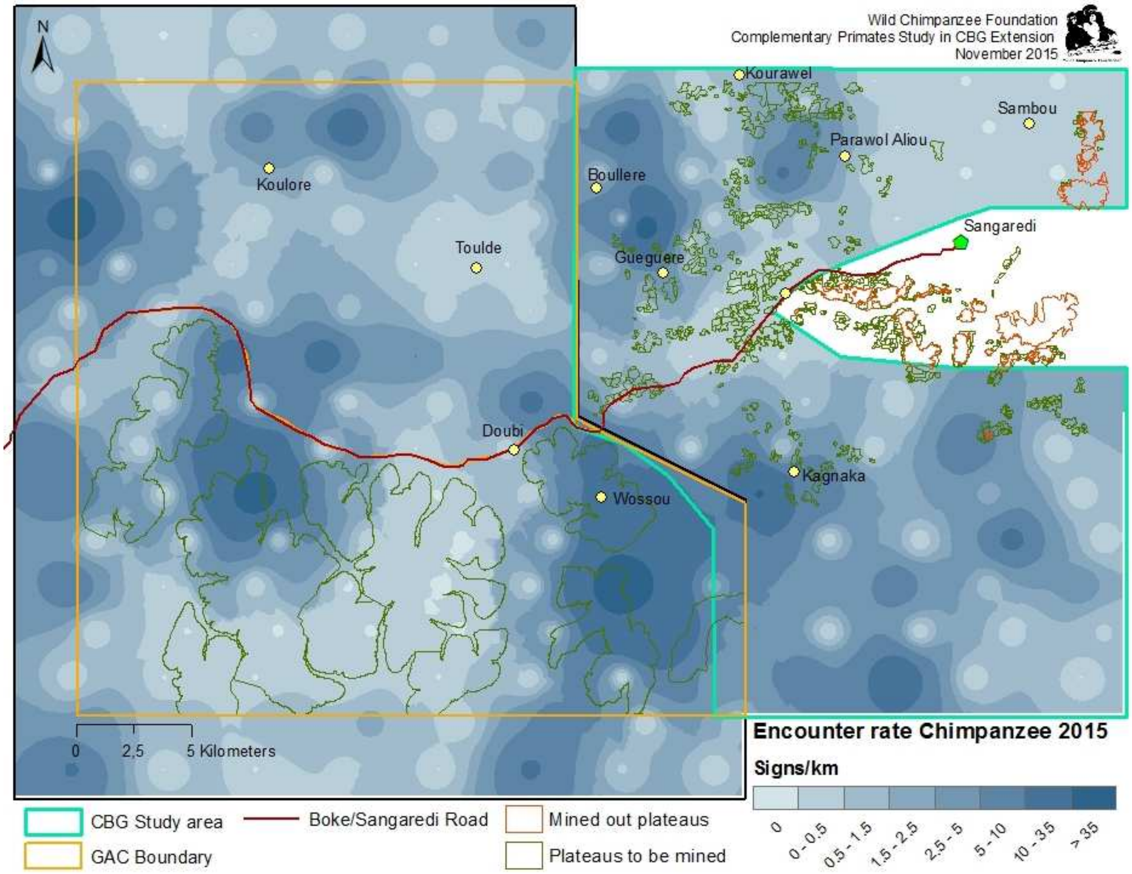

Figure 4: Spatial distribution map of chimpanzee signs in both the GAC concession (February to June 2015) and the CBG-Halco concession (September to October 2015). Despite the fact that two different time periods are represented, this suggests some spatial continuity of chimpanzee range between the two concessions.

3.1.3 CHIMPANZEE HABITAT IN CBG CONCESSION

The Boké region is a dry savanna mosaic. The different types of habitat identified in the CBG concession along the WCF transects are presented in Table 3. Field protocols are used to classify vegetation structures seen along the transects into habitat types, distinguishing 8 different habitat types (see footnote 2). As can be seen from Table 3, fallow land is the most common habitat type in the CBG concession followed by woody savannah and grassy savannah, while forests are quite rare. Interestingly, chimpanzees have a preference for nesting in the forest habitat where we found five times more nests then predicted from the proportion of forest in the concession, while agricultural lands is clearly avoided by the chimpanzees as they build over 4 times less nests there then would have been predicted from the habitat proportion. This illustrates the bias towards nesting in forests compared to fallow or woody savannah (Table 3). Nevertheless, trees in fallow habitat remain important for chimpanzees for nesting purposes as forest habitat is relatively rare.

Table 3 : Proportion of different habitat types in the CBG concession and distribution of the chimpanzee nests observed per habitat type (2015). Total distance covered for each habitat type[5] and total number of chimpanzee nests on transects are presented.

Habitats	Distance covered (km)	Proportion of habitat type (%)	Number of nests	Proportion of nests (%)
Fallow	68.14	49.09	283	80.63
Grassy savannah	40.82	29.41	0	0
Agricultural land	14.66	**10.56**	9	**2.56**
Woody savannah	6.37	4.59	6	1.71
Gallery forest	3.58	**2.58**	52	**14.81**
Forest	2.62	1.89	1	0.28
Villages area	2.45	1.77	0	0
Bushy shrub	0.16	0.12	0	0
Total	**138.89**	**100**	**351**	**100**

Furthermore, we can see that chimpanzees select the tree species in which they build their nest carefully, with a bias towards only a few tree species (see Table 4). Chimpanzees preferentially build their nests in the tree species *Elaïs guineensis* (34.19%), *Erythrophleum guineense* (16.24%) and *Parkia biglobosa (*12.25). *Elais guineensis* trees are numerous in gallery forest in the CBG Concession, which is a relevant habitat for chimpanzees. A habitat structure study will allow the WCF to confirming whether the preference for this tree is proportional to the availability of these trees species and therefore ascertain its relative importance. Finer differences can be seen in the way that chimpanzees show a preference for building nests preferably in three year-old fallow land over others types of fallow. One and two year-old fallows do not seem to be preferred, and they are clearly less used relative to their availability.

[5] *Short definition of the habitat used by the WCF since 2009:*
Fallow: temporary non-cultivated land.
Grassy savannah: dominance of herbaceous strata with no tree or almost no tree.
Agricultural land: cultivated areas (fields and plantations)
Woody savannah: continuous presence of herbs and strong presence of trees of more than 8m
Gallery forest: strip of mature trees of different sizes growing along a water course
Forest: tree stands with no herbaceous strata on the ground.
Village area: Areas often without vegetation within sight of human habitations.
Bushy shrub: dense shrub strata without trees

Table 4: Proportion of nests observed per tree species used by the chimpanzees in the CBG concession to build their nests (2015).

Tree species used for nest	CBG - 2015
Elaeis guineensis	**34.19**
Erythrophleum guineense	**16.24**
Parkia biglobosa	12.25
Carapa procera	10.83
Parinari excelsa	9.12
Cola cordifolia	4.27
On the ground	**2.56**
Pterocarpus erinaceus	2.28
Afzelia africana	1.71
Daniellia oliveri	1.14
Albizia zygia	1.14
Other	4.27

Nine chimpanzee nests have been found on the ground in 5 year-old fallow. Ground nests were previously observed during the Foutah Djallon survey in forest habitat but never in the GAC concession.

3.2 Other primates

3.2.1 Relative abundance (encounter rate)

The red colobus monkey is of particular interest due to its status as an endangered species according the IUCN (International Union for the Conservation of Nature) red list (2014). The presence of Temminck's red colobus monkey (*Procolobus badius temminckii)*, in the neighbouring GAC concession was confirmed when its mating call was heard by a WCF expert in 2010. In 2013 it was reconfirmed with a camera trap video. No observations of Temminck's red colobus were made during the rapid assessment; this elusive and rare species will require more rigorous research and the use of camera traps to verify its presence in the CBG–Halco concession.

Table 5 presents the encounter rate per km of direct and indirect observations for four primates other than chimpanzees. Despite the fact that the overall encounter rate for monkeys in the CBG–Halco concession is greater than that of the GAC concession, we need to interpret this with some care. The CBG–Halco inventory was undertaken in the wet season – a time when there were many crops in the fields, where detection of indirect signs is easier than in the close forest. If we look at the data closely we can see that the vast majority of primate signs in the CBG–Halco concession were indirect signs i.e. droppings and feeding remains.

Table 5: Comparison between CBG- Halco and GAC concession showing non-chimpanzee primate encounter rates (signs/km).

CBG – Halco					
	Feeding remains	Feces	Direct Observation	Vocalisat ions	**Total**
Primates (total)	0.81	0.02	0.05	0.08	**0.99**
Cercocebus atys	0	0	0	0.04	**0.04**
Cercopithecus mona campbelli	0	0	0.04	0.02	**0.06**
Chlorocebus sabaeus	0	0	0	0.01	**0.01**
Erythrocebus patas	0.19	0	0.01	0.01	**0.21**
Papio papio	0	0	0	0	0
Unindentified monkeys*	0.62	0.02	0	0	**0.64**

3.2.2 SPATIAL DISTRIBUTION

Figure 5 shows the spatial distribution for all monkey species within the CBG-Halco concession during the rapid assessment. All the primate species within the concession while adaptable, have known preferences for habitats that occur only in a small percentage of the area surveyed; the species *Cercocebus atys atys* (or Sooty Mangabey) is associated in Guinea with woodland savanna (Oates et al. 2008) and it is known, in general, for its preference for marshy/swamp habitats ; the *Cercopithecus mona* superspecies (the Cambell's monkey is a subspecies of this) relies on dense, relatively unbroken canopy in gallery forests although the subspecies here may also be found in secondary growth that borders with fields; the *Erythrocebus patas* (Patas monkey) has a preference for a range of open grassland habitats and is commonest in shrubby wooded savanna; *Chlorocebus sabaeus* (Vervet or Green monkey) has a range of habitat preferences within forests, rainforests and woodlands; all rely on fruits and seeds and will raid crops if food sources become scarce. (Kingdon et al. 2008, Kingdon 2014, Oates et al. 2008).

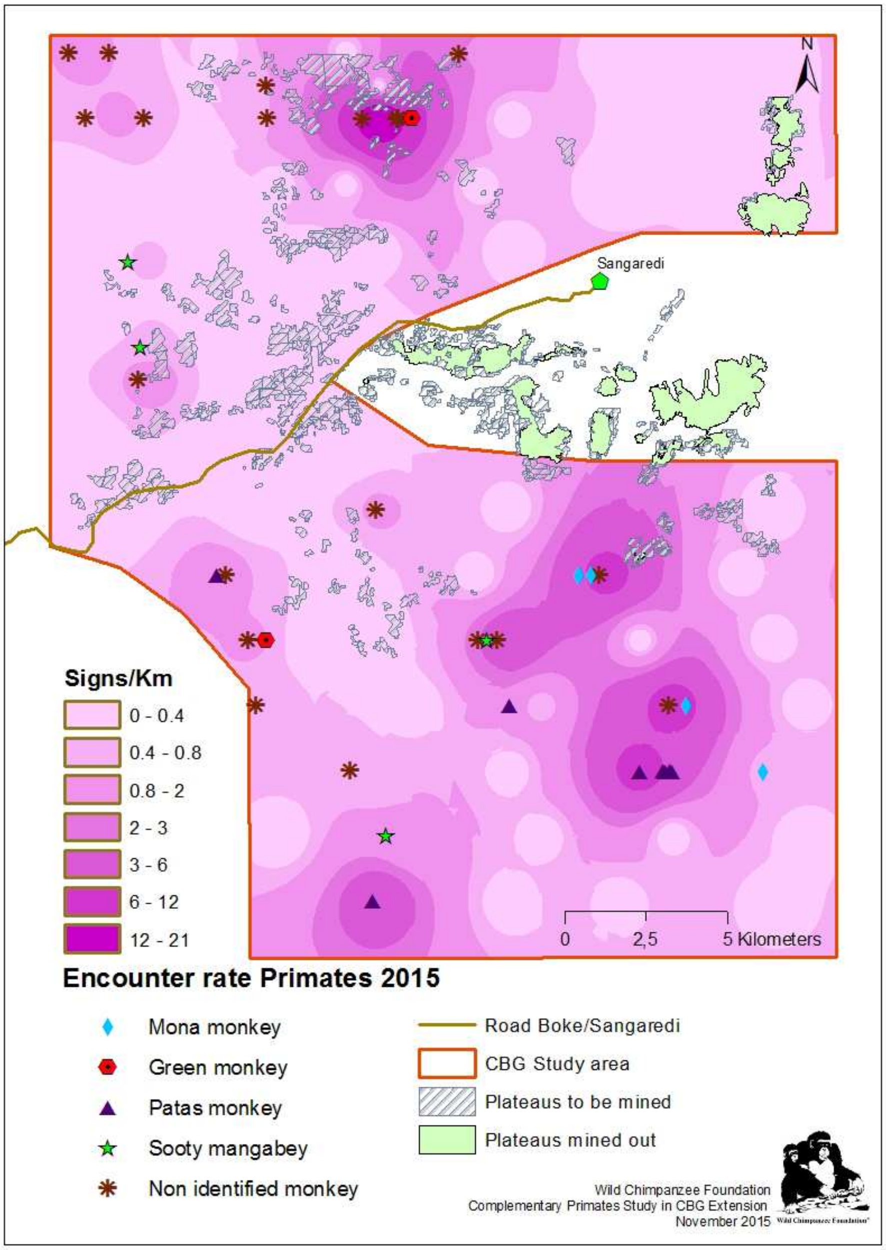

Figure 5 : Spatial distribution map of the four monkey species signs found in the CBG-Halco concession in 2015

Despite the relatively low coverage of gallery forest, over 30% of direct sightings of primate species were in open gallery forest or in relatively old fallow. A huge majority of indirect observations (64%) for monkey species were found in fields and these were exclusively feeding remains. *Cercopithecus mona campbelli* was found almost exclusively in an area south of the town of Sangaredi and 67% of these observations of this species were in open gallery forest followed by 22% in 3 year old fallow.

4 CURRENT THREATS TO WILDLIFE AND CHIMPANZEES WITHIN THE CBG CONCESSION

Figure 6 below, shows the spatial distribution of signs of all human activity observed along the transects and extrapolated for the whole concession. It documents higher concentrations of human activity signs in the northern part of the concession; just south of Sangaredi; and the areas of current mining. These observations included active mining signs as well as signs of exploration done recently in the new Halco concession.

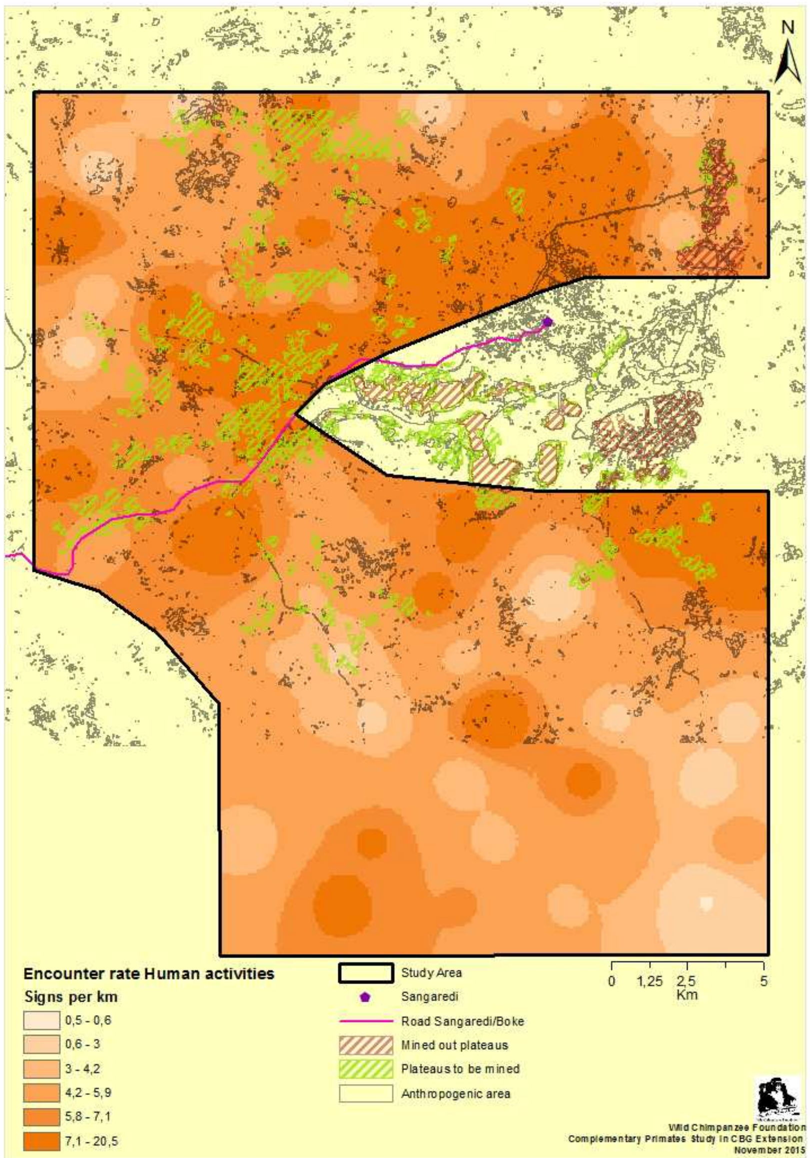

Figure 6 : Spatial distribution map of human activities in CBG-Halco concession in September/October 2015.

Table 6 below, details ten of the different types of human activities most frequently seen in the concession. These observations represent activities that cause disturbance to wildlife and/or the destruction of habitat. Here we can see a greater presence of signs of human activity than signs of primates with an encounter rate of 2.8 signs per kilometer for walking trails while the encounter rate for all primates (excluding chimpanzees) was 0.99 signs per kilometer (Table 5). Furthermore, when compared with the chimpanzee distribution (Figure 2) or the distribution of all other primates (

Figure 5), it is clear that human activity (as shown in Figure 6 above) is negatively associated with these species.

Table 6: Most frequently encountered signs of human activity within the CGB-Halco concession 2015. Walking trails are paths mainly used to walk between villages and from villages to fields.

Human activities observed	Encounter rate (signs/km)	% Total
Walking trails	2.8	47.0
Mine paths	1.0	17.3
Plantations	0.4	6.2
Fields	0.3	5.5
Farmer's camps	0.3	4.7
Charcoal ovens	0.2	3.8
Timber exploitation (>10 trees)	0.2	3.6
Villages	0.1	2.1
Trap	0.1	1.2
Non-timber forest exploitation	0.1	1.0

5 CRITICAL HABITAT – BIOLOGICAL VALUE OF THE CBG CONCESSION

5.1 CRITICAL HABITAT DEFINITION

Under the biological definition, critical habitats are the areas including essential resources for the survival of the animal species considered. In the case of chimpanzees, a critical habitat will be defined by:

- The food resources required for feeding,
- The material resources necessary for building the nests at night (for protection against natural predators),
- Safe haven to avoid human interferences (hunting, habitat destruction, *etc*.),
- Corridors for travel between the habitats described in the three points above and between chimpanzee communities.

Abundant studies have confirmed the key importance of such factors on chimpanzee survival (Marchesi et al. 1995, Walsh and White 2003, Kormos and Boesch 2003, Plumtree et al. 2005, Kuehl et al. 2008, 2009, Campbell et al. 2008, Köngden et al. 2008). In-field data collection and verification of available information has been conducted for the critical habitat assessment. The spatial distribution of chimpanzees based on all signs of presence takes into account the natural factors which affected the distribution of chimpanzees as noted above (food resources, nesting trees, "safe haven" areas and corridors) and will allow us to determine the Critical Habitat on the concession

5.2 CRITICAL HABITAT FOR CBG – HALCO CONCESSION

The presence of an endangered species - the western chimpanzee (*Pan troglodytes verus*) – in the CBG-Halco concession has been confirmed by this study. Chimpanzees occur throughout the concession, where several communities of chimpanzees seem to coexist. Based on data collected in the concession, we estimate the mean population size at around **62 individuals (weaned and unweaned)**. As explained in the section 3.1.1, as a conservation measure, and to avoid the danger of underestimating the size of the population due to territory overlap and the fact that chimpanzee ranges are not limited by the boundaries of the concession, we need to consider **the upper estimate** as the **Biological Value before mining operations continue in the CBG-Halco concession: 118 individuals.**

However, this value is likely to be an underestimation for two reasons: first the time constraint did not allow WCF to survey a buffer area outside of the concession as we canonot expect chimpanzee group territories to follow legal mining concession and therefore different chimpanzee groups we surveyed only part of the territories leading to an underestimate of the number of chimpanzees. Second, it is important to remember that mining operations have already started in the CBG-Halco concession, around the southern part of Sangaredi, and in the neighboring concession east of that concession. This resulted in a gradient of chimpanzee abundance visible throughout the Halco concession (see Figure 2). In other words, the present biological value of the concession already includes some direct and indirect negative impacts from the ongoing mining activities and therefore it **underestimates** the real biological value.

This value represents the **Biological Value of the CBG concession in 2015, before the start of mitigation projects**. The biological value is the qualitative value of Critical Habitat that will be impacted by mining activities. If there is no effective mitigation, this metric will represent the population impacted. As a result, and based on the definition established by the IFC PS6 (2012) and IFC Guidance Note 6 (2012b), the whole concession is considered **Critical Habitat under criterion 1**. However, based on the fact that more than 17,000 chimpanzees are still present in Guinea (WCF 2012), the whole CBG-Halco concession falls within the **Tier 2 sub-criteria** (see IFC Guidance Note 75 2012b).

6 HIERARCHY OF MITIGATION AND OFFSET RECOMMANDATIONS

6.1 Mitigation plan and long term monitoring

A plan must be to be implemented with mitigation and avoidance measures for all main negative impact effects of mining operations. A module-based plan will formulate actions to avoid potential negative impacts, and develop proactive mitigation actions for mining activities as well as for the communities and future employees following the IFC recommendations.

- The mitigation hierarchy in CBG concession should:

1. Preserve water function of the plateaus in the concession by protecting main watershed (avoidance area)
2. Rehabilitate the gallery forest system along water courses (avoidance area)
3. Establish and rehabilitate fauna valid corridors between plateaus
4. Develop a concept minimizing access and extraction roads in order to reduce impacts (minimize fragmentation of habitat)
5. Establish an active fauna passage system across access roads and production zones
6. Change local human attitude towards chimpanzees, hunting and bushmeat control within the entire concession, and develop a no hunting policy for CBG employees
7. Establish supply chain and wood trade restriction
8. Create set asides within the concession

Each module would be detailed with maps and criteria to take in account the specificity of the concession for implementing this module on site. Main measures of protection of natural resources will help to protect large mammals in generals.

Lenders should specifically be engaged with respect to (i) the extent of conversion and degradation; (ii) the alternative analyses; (iii) biodiversity and ecosystem services values associated with the natural habitat; (iv) options for mitigation, **including set-asides,** according to the paragraph 15 of the IFC PS 6 (2012) (see Box 1)

BOX 1:

Natural Habitat

15. In areas of natural habitat, mitigation measures will be designed to achieve no net loss9 of biodiversity where feasible. Appropriate actions include:

- **Avoiding impacts on biodiversity through the identification and protection of set-asides[10]**;
- **Implementing measures to minimize habitat fragmentation, such as biological corridors;**
- **Restoring habitats during operations and/or after operations; and**
- **Implementing biodiversity offsets**.

10 Set-asides are land areas within the project site, or areas over which the client has management control, that are excluded from development and are targeted for the implementation of conservation enhancement measures. Set-asides will likely contain significant biodiversity values and/or provide ecosystem services of significance at the local, national and/or regional level. Set-asides should be defined using internationally recognized approaches or methodologies (e.g., High Conservation Value, systematic conservation planning)
See GN45/48/49

Set-asides should be High Conservation Value (HCV) areas (see paragraph GN35). IFC Guidance note 49 states "Set-asides and biodiversity offsets are related but different concepts. **Biodiversity offsets are intended to compensate for significant residual negative impacts**, and must demonstrate no net loss, and preferably net positive gains of biodiversity. **Set-asides are the equivalent to avoidance measures** along the mitigation hierarchy and are sometimes prescribed by the government to reach a certain percentage (e.g., 20 percent) of the land area to be converted."

According to our results one particular area could be earmarked as a set-aside in CBG-Halco concession. This is the southern part of concession as it will not be mined at all (Figure 7). This southern part is an area potentially large enough to encompass the territory of one chimpanzee group and setting it aside would safeguard one subpopulation of the original chimpanzee population. However, this does not reduce the negative impacts in the mining areas.

As a second proposition, one could suggest the area around the village of Bollore in the North West of the CBG-Halco concession; however the area is relatively small and therefore would not function as a set-aside for a natural chimpanzee group. Furthermore the degraded habitat in the west in the GAC concession (see Figure 4) would also prevent it from being a good chimpanzee set aside.

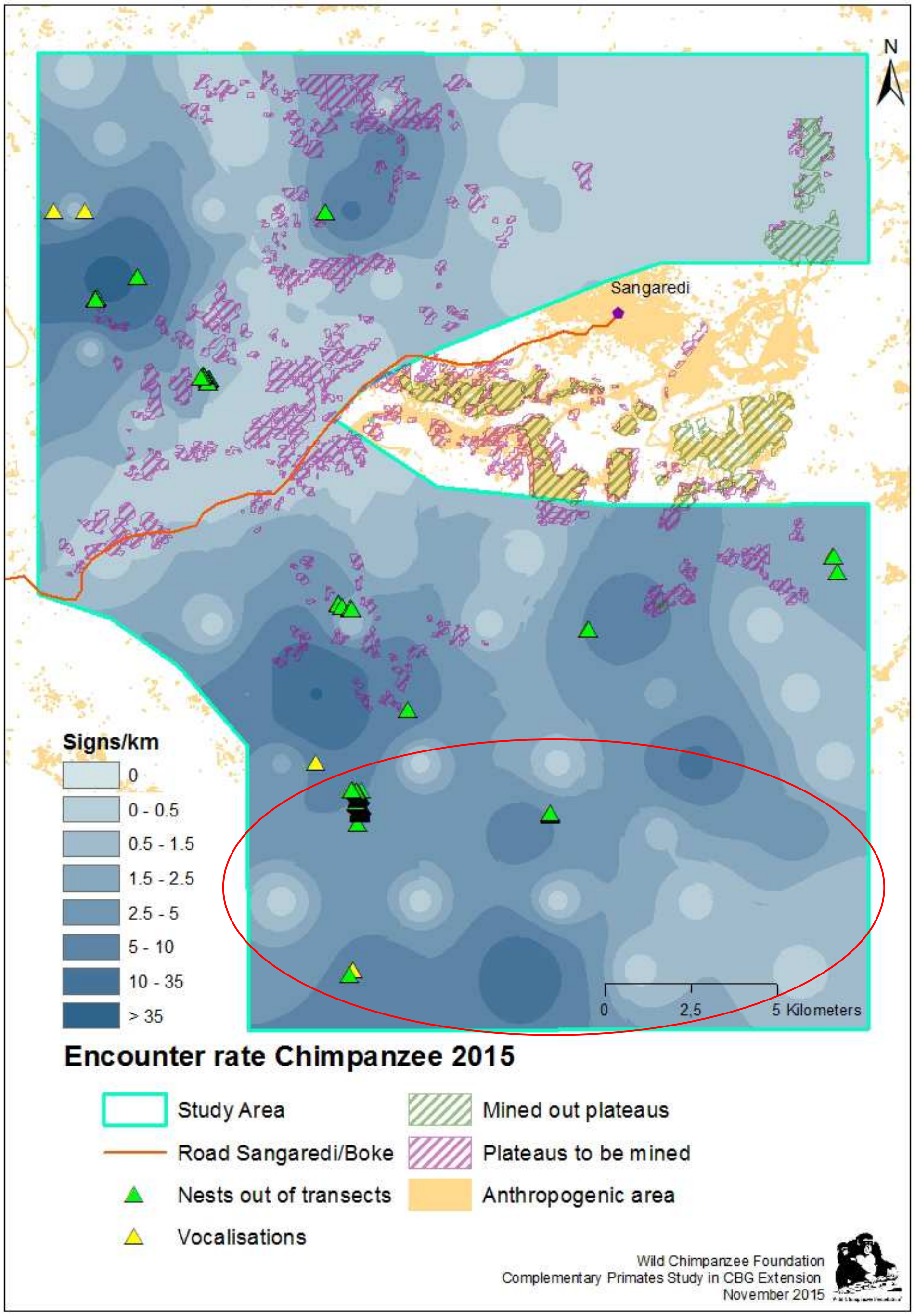

Figure 7: One priority potential set-aside in CBG-Halco concession to mitigate negative impacts on chimpanzee population according to the results of the rapid assessment study in 2015.

6.1.1 IMPROVING CHIMPANZEE POPULATION MONITORING

According to this first assessment, detailed and regular surveys should be implemented in order to monitor the long-term impact of mining activity. Chimpanzee populations may fluctuate from year to year and an in-depth study will grant us the information needed to assess the impact of mining activities.

In addition, to better understand the distribution of chimpanzees in the concession, a camera trap study could be implemented that through individual recognition could allow us to follow individual movements within the concession, as well as determine the limits of territories. This would also allow us to confirm rare animal species such as the endangered red colobus monkey or others and also start a systematic program of identification. Identifying individual chimpanzees and using such cameras is the least invasive method for tracking the exact movements of groups, observing group interactions and monitoring the general health of wildlife.

Since, theoretical and legal concession boundaries cannot reflect the chimpanzee group limits, and we know that chimpanzee groups possess overlapping territories with neighbouring groups, we need to also consider the areas bordering the concession to better monitor the chimpanzee population. This should be done in combination with GAC and potentially RUSAL in order to evaluate the cumulative negative impact of mining activities on the population that resides in the prefecture of Boké, and allow all involved a greater knowledge of the population dynamics, demographics and ecology.

6.1.2 EFFECTIVENESS OF THE MITIGATION HIERARCHY IN THE CBG-HALCO CONCESSION

According to the mitigation hierarchy concept, the residual negative impacts after mitigation need to be compensated for in an offset (IFC PS6 2012). Thus the question remains of whether after implementation of the first eight modules of our Management Plan, some residual negative impacts will still be observed. Five main factors in the CBG concession project concur in making it certain that important residual negative impacts will remain concerning the chimpanzees:

1- Bauxite deposits are very close to the surface making open-pit mining the only option. Contrary to underground mining, open-pit mining requires the removal the surface soil and therefore destroys the natural environment for the duration of the mining operations (see section 4.1.1).
2- Rehabilitation possibilities post-mining operations are very limited in African tropical ecosystems due to the extreme biodiversity and multi-layer complexity of these natural ecosystems (see section 4.1.1). Climax tropical forest species grow very slowly, and only with the appropriate soil properties making natural regeneration even in undisturbed forest extremely slow (Cairns 1986, Stanturf et al. 2002, Stanturf 2005). Furthermore, the bauxite layer will be gone and therefore its functions concerning groundwater retention, filtering and preservation will not be available after rehabilitation.
3- Wet seasons in Guinea are especially violent leading to very strong and rapid soil erosions. This will be a major challenge to any rehabilitation projects as the soil will initially have no natural stabilization and this will delay any effective rehabilitation.

4- Chimpanzees are extremely sensitive to human disturbance and will avoid noise by all means[6]. They are known thereafter to avoid the human-disturbed areas for extended periods of time[7]. During the period during in which chimpanzees are pushed away, social structure and the reproduction rate of females will sharply decrease.
5- Chimpanzees are well known to be highly territorial so that any chimpanzee intruders will be violently chased or killed[8]. Therefore, individual chimpanzees avoiding mining operations are at high risk of being killed and not being able to find a suitable territory in which to reestablish themselves. This is even more so in the CBG-Halco concession due to the mining operations going on or starting around it. This will result in high net loss of chimpanzees within a very short timeframe.

6- Translocation of endangered threatened species has been attempted in the past with mixed success[9]. However, this cannot be considered for chimpanzees in such a project for the following reasons: first translocation takes individuals away from one site to release them in another site, and it is therefore not a mitigation activity as it produces a direct negative impact at the site of the source population. Second, the capturing of wild chimpanzees is very time consuming, risky and with uncertain outcomes resulting in important stress and risks to the wild individuals. Third,

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[6] Many studies have clearly shown this under different types of human disturbances. The most commonly studied disturbance continues to be logging that revealed in many projects not only that chimpanzees would avoid the direct area of disturbance but that chimpanzee population size would decrease by 70-90% in most situations (Tutin and Fernandez 1984, Matthews and Matthews 2004, Morgan and Sanz 2007). Only the most controlled sustainable logging schemes could result in some improvements whereby decrease in chimpanzee populations of 40-60% where still observed (Matthews and Matthews 2004). Similar negative and avoidance effects were documented for road constructions that often act as permanent genetic boundaries preventing any animal movement (Craul et al. 2009). The negative effects of mining on the environment and animal presence has been amply documented in several projects in the tropics (Duran et al. 2013) revealing that disturbance negative effects due to mining have been regularly measured over 5 to 15km away from the direct areas of disturbance.

[7] In the few cases where the recolonization of previously human disturbed areas was followed, chimpanzees were observed to be slow at coming back in such areas (Boesch pers. obs., Morgan and Sanz 2007).

[8] All long-term studies with wild chimpanzees have documented the territorial behavior of chimpanzees and showed that the violent inter-group encounters regularly lead to bad injuries inflicted to outnumbered individuals resulting in many deaths (Goodall 1986, Kawanaka and Nishida 1990, Nishida et al. 1985, Boesch and Boesch-Achermann 2000, Watts and Mitani 2001, Watts et al. 2006, Boesch et al. 2008, Boesch 2009). Whenever imbalance of power between two chimpanzee groups is important, the larger one has been seen to carry out a complete extinction of the weaker one within a few years (Kawanaka & Nishida 1990, Goodall et al. 1979, Watts et al. 2006).

[9] Translocation, the deliberate and mediated movement of wild individuals or populations from one part of their range to another, has been used mainly for birds and carnivores for different reasons including conservation, or human-wildlife conflict resolution (Fischer and Lindernmayer 2000, Jule et al. 2008). Translocation success with wild animals are rare, even when performed with birds (17% out of 60 studies, Fischer and Lindermayer 2000), often due to difficulties of the individuals to adapt to the new habitat, face predation, disease or because animals left the site of release. Furthermore, the stress associated with translocations has often dramatic consequences on health of the individuals, and can lead to their death.

translocation projects with wild great apes have never been done and would attract a lot of scrutiny and potential critics from the international press and the conservation community (Jule *et al.* 2008, Fischer and Lindenmayer 2000).

Thus, even in the unlikely event that restoration of a chimpanzee-friendly forested environment would succeed in a few decades, the original chimpanzee population that inhabited the concession before mining activities would not exist anymore. The assumption that original chimpanzees could come back to their original disturbed habitat is not feasible, as the original chimpanzees will have been subjected in the meantime to many negative pressures outside of the CBG concession (human-animal conflicts and competition between chimpanzee groups in the new territories they have been forced into). Finally, if chimpanzee emigration into that restored habitat is observed it will come from other groups, assuming that a healthy chimpanzee population is still be available at that time outside the CBG concession, despite the presence and developing activities of GAC, RUSAL and other neighboring mining concessions (Henan-China).

In face of these facts, the WCF guesses that 70% of the chimpanzee biological value in the CBG-Halco concession will be negatively impacted after mitigation. In other words, **83 individuals** from the original 118 large population will be lost after mitigation and constitute the **residual negative impact** within the CBG project. Therefore, to compensate for the residual negative impacts and with the goal of achieving a “net gain” result, it is mandatory to implement an offset program outside of the CBG-Halco concession (see Box 5, paragraph 19 of the IFC standard 6, 2012 and Box 6, IFC Guide Note 107).

6.2 OFFSET PLAN

Following the IFC PS6, unavoidable residual negative impacts on chimpanzees (great ape species) due to mining operations should be compensated through a robust and targeted offset program within the country. After extensive national surveys, the WCF is now in a position to propose an offset site allowing CBG to reach the IFC PS6 requirements (§ 17, 2012).

Now, to account for the **uncertainties in the power to “predict”** the effective **residual negative impacts,** as well as to **achieve the planned “future” net gain outcome** for the residual negative impacts, many international studies have recommended an “offset ratio” **as large as 1:10** under situations with high uncertainties both about the real estimation of the impacted population and about the effectiveness of the offset program that normally extends over long periods of times (Moilanen et al. 2009, Quétier and Lavorel 2011, Bull et al. 2013). The biology of and the threats on chimpanzees are relatively well known compared to many other animal species, and this would suggest that we could consider a lower offset ratio. However, at the same time chimpanzees have a very low reproductive rate and the uncertainties about maintaining a strong and continuous support for conservation activities in Guinea are important, suggesting a higher offset ratio. To account for both and remain within a realistic domain, the WCF suggests considering an **offset ratio of 1:3**. In other words, we need to compensate with **249 chimpanzees**.

However, in agreement with IFC note of caution when compensating for great apes, due to their very special status as the closest living relative to humans, the WCF strongly recommends a future re-evaluation mechanism for both the estimated 70% of residual negative impacts after mitigation in the concession and of the offset ratio (1:3) at regular intervals to ensure the fulfillment of the "net-gain" objective. The WCF proposes a 3-year evaluation mechanism based on field data in order to adapt these two values to any deviation from the presently proposed predictions that are observed.

BOX 2

§19. Whenever biodiversity offsets are proposed as part of the mitigation strategy, the client must demonstrate through an assessment that the project's significant residual impacts on biodiversity could be adequately mitigated to meet the requirements of paragraph 17.

BOX 3

GN107. In addition to the requirements in paragraph 17, in areas of critical habitat the client will be expected to demonstrate net gains (also known as "net positive gains") of the biodiversity values for which the critical habitat was designated, as stated in paragraph 18 of Performance Standard 6. Net gains are defined in footnote 15 of Performance Standard 6 and could be considered "no net loss *plus*;" therefore, the requirements defined for critical habitat build upon and expand those defined for natural habitat. The client's mitigation strategy, which will be designed to comply with paragraph 17 and to achieve net gains, must be described in a Biodiversity Action Plan (BAP). Where the client has prepared a sufficient Biodiversity (or Ecological) Management Plan (BMP) that adequately describes on-site mitigation measures, the BAP could be reserved for describing how the client plans to achieve net gains. Net gains may be achieved through the biodiversity offset, and in instances where a biodiversity offset is not part of the client's mitigation strategy (i.e., there are no significant residual impacts), net gains would be obtained by identifying additional opportunities to enhance habitat and protect and conserve biodiversity (see also paragraph GN34).

Figure 8: Extracts from the IFC Guidance notes 6 (2012)

Damages in the CBG concession might not cause direct extinction of endemic species, as surrounding populations are widely available to offer compensation to the on-site damages. However, here it is important to keep in mind that the cumulative negative impacts due to adjacent mining activities may multiply the negative impacts on local animal populations leading to local extinctions. The IFC standard addresses the possibility of compensation when the residual predicted impacts cannot either be mitigated or avoided and when the impact affects 'vulnerable' areas or species that are not 'irreplaceable'. The **site is therefore labeled as 'vulnerable' and not 'irreplaceable'** (see Box 4, extract of IFC Guide Note 58)**.**

BOX 4

GN58. There are gradients of critical habitat or a continuum of degrees of biodiversity value associated with critical habitats based on the relative vulnerability (degree of threat) and irreplaceability (rarity or uniqueness) of the site. This gradient or continuum of criticality is true for all criteria as listed in paragraph 16 of Performance Standard 6. Even within a single site designated as critical habitat there might be habitats or habitat features of higher or lower biodiversity value. There also will be cases where a project is sited within a greater area recognized as critical habitat, but the project site itself has been highly modified.

Figure 9: Extracts from the IFC Guidance note 58.

This status allows the IFC to accept the project as a client and to acknowledge that the residual negative impacts to the Critical Habitat can be mitigated with the help of an offset.

Already in 2009, GAC and WCF agreed to implement an offset program to address residual negative impacts and to achieve a net gain objective if possible. To this end, between May 2009 and May 2011, WCF surveyed the major protected areas and potential chimpanzee-rich sites of Guinea, as well as the entire natural region of the Fouta Djallon to select a potential robust offset site. At the end, the WCF found that the Foutah Djallon region, and especially the Bafing river area, is an important hotspot for the conservation of the West African chimpanzee *Pan troglodytes verus*. Indeed, in the Bafing region, based on nest counts, we estimated the density of chimpanzees to be 0.58 weaned individuals per square km^2 giving a total population of 4,717 weaned chimpanzees for an area of 8000 km^2 (See Figure 10) (see WCF report 2014). Considering that 17.5% of the individuals of a population of chimpanzee are infants which are sleeping in the nest with their mothers (not nest builders) (as estimated by Goodall 1986, Plumptre and Reynolds, 1996, Boesch and Boesch-Achermann 2000), the population of chimpanzees (all individuals) in this surveyed area should be 5,542 individuals. This is the second highest density and by far the largest chimpanzee population currently listed in the country, and the largest continuous population for West Africa, making it an area of prime importance for the conservation of the species, and therefore a perfect offset site.

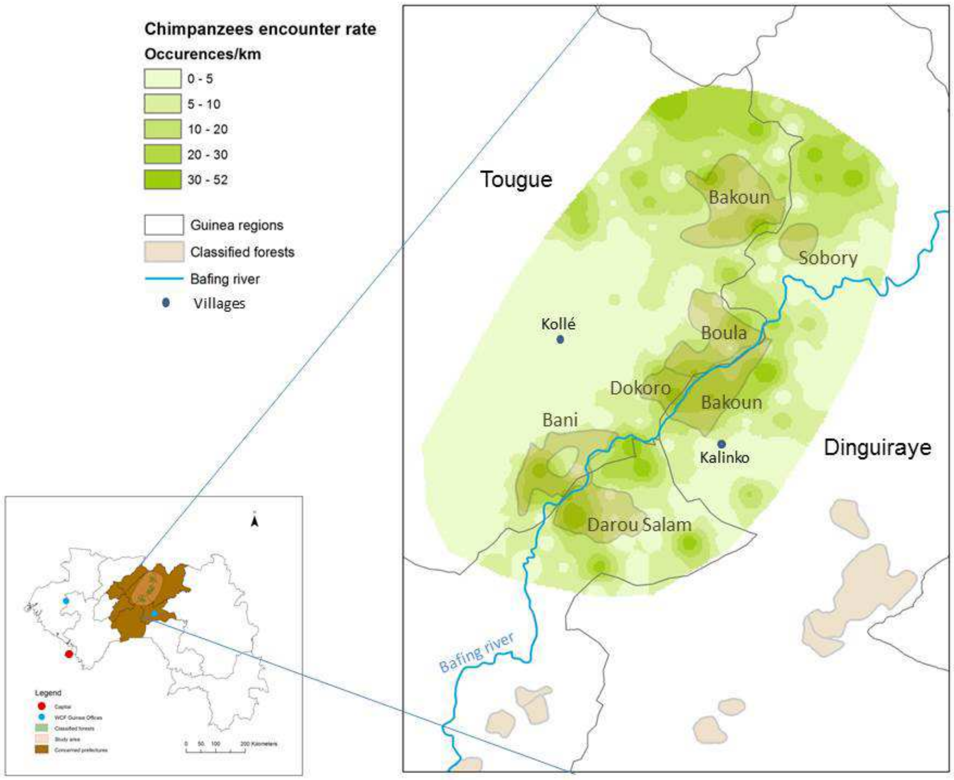

Figure 10: Spatial distribution of chimpanzees in the proposed offset site within the Bafing region (higher densities of chimpanzees are represented in darker green). The limits of the 7 Classified Forests present in this region are shown in dark yellow with their names.

Consequently, the WCF suggest that CBG use this 8 000 km² area with its 7 classified forests, as the offset site, and to implement there an integrated landscape conservation project. The WCF is presently working with the Guinean authorities responsible to develop a robust and sustainable biodiversity offset program to achieve the goals of "net-gain", "in-kind" and "perpetuity" requirements of the IFC PS6 (2012).

Furthermore, contact has already been made with other active mining companies in Guinea to develop a synergy for the successful implementation of this plan and propose an **aggregated biodiversity offset program**. Finally, the WCF has already made contact with the Guinean authorities in charge of the conservation of the Environment and the Protected Areas and has signed a collaboration agreement with them to form a broad based coalition to implement such a program.

To provide a first assessment of the financial involvement such an offset project could represent, based on WCF "net-gain and in-kind"[10] model of natural chimpanzee growth,

[10] The IFC Standard 6 favor an offset that would compensation for residual negative impacts on one endangered species „in-kind", meaning with the same animal species, with a „net-gain" result, thereby fully compensating for the negative impacts, securely financed "in perpetuity", favoring and endowment investment that preserves the capital and only interests are used (IFC 2012).

where the conservation activities would lead to a reduction of poaching of 1% per individual. The net-gain objective of 249 chimpanzees could be achieved in about 20 years with an offset population of 2000 chimpanzees.[11] This represents 36% of the present Bafing chimpanzee population and is equivalent of an area of 2909 km². The yearly running costs to implement conservation activities in such an area represent $685,000 per year[12]. When assuming an interest rate of 3% for an endowment trust fund, the running cost would be covered "in perpetuity" by an endowment of 23 millions dollars.[13]

[11] Smaller chimpanzee populations could be selected as an offset, but this increase importantly the uncertainties about reaching the „net-gain" objective to the point of making it unattainable for populations smaller than 500 individuals.

[12] International reviews of the cost of protecting one unit surface of protected areas have provided different values, but range on the average of 235 US$ per km^2 (Bloom 2004).

[13] The same calculation with an interest rate of 5% results in an endowment of only 13.7 millions dollars.

7 CONCLUSION

The rapid inventory of the CBG-Halco concession showed that, despite its proximity to the city of Sangaredi and the presence of active mining in the concession, it was inhabited by a chimpanzee population estimated at 118 individuals, present throughout the concession and showing a gradient with decrease chimpanzee signs the closer the observations are to the area of disturbance. It confirmed that human disturbance affects chimpanzees distance between 5 to 10 km. Due to the level of disturbance within the CBG-Halco concession our population estimation probably underestimates the original population size without mining impacts. While other primate species were confirmed throughout the concession, the endangered red colobus monkeys was not seen during the rapid inventory.

The implementation of the IFC Standard 6 would necessitate a mitigation hierarchy that may reduce the risk to chimpanzees from 100% to 70%. This would require an offset program that WCF suggests in the form of an aggregated offset program with the GAC offset project, as they cover the similar chimpanzee compensation needs. The Bafing region in the north-east of the Foutah Djallon has been shown to be the best location for such a project.

WCF recommends the implementation of regular surveys to follow the evolution of the chimpanzee population as the mining operations proceed, to develop a few new projects to better understand the population dynamic of the chimpanzees, as well as the population structure.

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